to be much smaller than a plot which could be covered by an observer. If waterfowl concentrations are small, the probability of getting a bird in a picture is small. A second disadvantage of this camera is that the instrument is turned on by an alarm clock. This means that the cameras have to be placed in the field not more than 12 hours prior to the time when they should begin recording; we are now working on a new circuit which will use a photocell to turn on the instrument. With minor modifications, this device should be applicable to a wide variety of wildlife sampling problems.

LITERATURE CITED

ABBOTT, H. G., AND A. W. COOMBS. 1964. A photoelectric 35-mm camera device for recording animal behavior. J. Mammal. 45 (2):327–330.

BUCKNER, C. H. 1964. Preliminary trials of a camera recording device for the study of small mammals. Canadian Field Naturalist 78(2):77–79.

DODGE, W. E., AND D. P. SNYDER. 1960. An automatic camera device for recording wildlife activity. J. Wildl. Mgmt. 24(3):340–342.

GREEN, G. W., AND D. C. ANDERSON. 1961. A simple and inexpensive apparatus for photographing events at pre-set intervals. Canadian Entomol. 93(9):741–745.

GYSEL, L. W., AND E. M. DAVIS, JR. 1956. A simple automatic photographic unit for wildlife research. J. Wildl. Mgmt. 20(4):451–453.

PEARSON, O. P. 1959. A traffic survey of *Microtus-Reithrodontomys* runways. J. Mammal. 40(2):169–180.

TAYLOR, J. MARY, AND H. JEAN. 1964. Rechargeable battery power for a portable photographic recorder. J. Wildl. Mgmt. 28 (2):406–408.

Received for publication November 30, 1964.

RECENT MODIFICATIONS IN BANDING EQUIPMENT FOR CANADA GEESE

GLEN A. SHERWOOD, Seney National Wildlife Refuge, Seney, Michigan

Abstract: Specialized banding equipment for Canada geese (*Branta canadensis*) was constructed and used at the Seney National Wildlife Refuge. The equipment included holding cages, a revolving banding table with band-dispensing turret and holding funnels, and a weighing tripod. Use of the equipment significantly reduced handling and injury to the geese.

Several thousand geese are trapped, handled, and banded each year across North America. Any new equipment or methods that will reduce bird handling or injury and increase banding efficiency are sought after by field men. The purpose of this paper is to describe the construction and use of improved and modified banding equipment for Canada geese.

I should like to thank Charles A. Hughlett for suggestions, Marion J. Schrock for his constructive ingenuity, and John B. Hakala for encouragement and comments on the paper.

MATERIALS AND METHODS

The banding equipment was composed of three parts: (1) holding cages; (2) a banding table consisting of a stand, a table with holding funnels, and a band-dispens-

ing turret; and (3) a weighing station (Figs. 1–3). The table was a modification of a somewhat similar device developed by Lyle J. Schoonover and Kenneth Larson at the Sand Lake National Wildlife Refuge.

The movable holding cages were constructed of 1 × 1- or 1 × 2-inch weld wire, spot welded to a frame of ⅜-inch steel rod. Dimensions (in inches) were height, 24; length, 48; width, 31. There were drop doors at each end measuring 24 × 28½ inches, and a top door, 22 × 29½ inches. Open slots, constructed of ⅜-inch steel rod, provided guides for the drop doors. Three-eighths-inch exterior plywood covered the cage floor and was supported by an extra center rib of ⅜-inch steel rod.

For greater ease in handling the geese, a separate drop door (24 × 10 × 31 inches) constructed of weld wire and ⅜-inch rod was placed at the edge of the *pot* of the trap leading to the holding cages. Four legs, each 20½ inches long, extended below the drop door. When pushed into the ground, the legs anchored the drop door.

Three-quarter-inch exterior plywood was used to construct the 4-foot diameter banding table. Eight holes 7½ inches in diameter were cut around the edge of the table to hold removable funnels (Fig. 2). A downward pointing, 2½-inch pipe 6 inches long was welded to a steel plate 8 inches in diameter mounted on the bottom surface of the table. A 1½-inch hole drilled in the middle of the plate was centered immediately beneath a 1⅜-inch hole through the center of the table.

The stand to hold the table consisted of a steel base plate, 27 inches in diameter, welded to a 2⅜-inch (outside diameter) pipe, 28 inches long. Thus, the table could be slipped onto the stand and would easily revolve on it.

Twenty-gauge galvanized steel was used to construct the funnels. Each funnel measured 10 inches high, with an 8½-inch opening on top and a 5-inch opening at the bottom. All edges were rolled to prevent injury to the geese. The upper edge was flanged outward ½ inch to hold the funnel in place on the funnel harness.

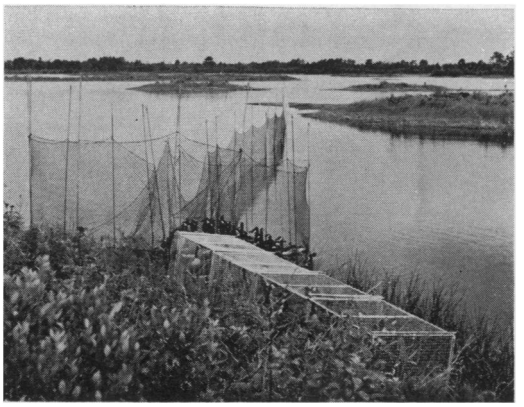

Fig. 1. Holding cages running from *pot* of trap.

The band-dispensing turret was composed of 10 dowels (1 × 31 inches) attached at each end to circular pieces of ¾-inch exterior plywood 9¾ inches in diameter. A piece of plywood 12 inches in diameter was attached to the bottom 9¾-inch piece. The dowels were placed 3 inches apart, center to center, and shaped to hold 50 preopened goose bands each. A hardware snap fastener was mounted at the top of each dowel to prevent band loss when closed but to allow band replacements when opened. Storm-window turn buttons were mounted beneath each dowel to keep the bands from slipping off while being transported. The buttons could be twisted open to allow easy band removal when needed. Age and sex designations were painted at the bottom of each dowel to facilitate banding and data recording. The banding turret was supported by a 1⅝₁₆-inch (outside diameter) pipe 41 inches long which ran the length of the turret

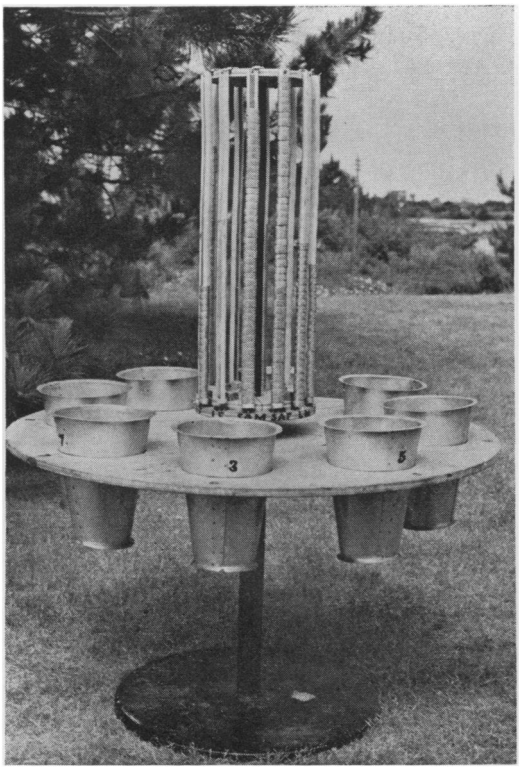

Fig. 2. Banding table showing all components: stand, table, funnels, and band turret.

Fig. 3. Weighing station. Note how funnel fits on the harness.

down the center and projected 10 inches below. The turret could then be placed on top of the table by inserting the pipe through the table and into the stand below. A baffle in the stand held the turret 2 inches above the table and allowed table and turret to revolve independently of one another.

Aluminum conduit was used to construct the weighing tripod. A lightweight chain was attached to the legs of the tripod to prevent excessive spread. The funnel harness, which was hung from the scales, was constructed of ⅜-inch steel rod. The upper portion measured 24 × 10⅜ inches. It was welded at the bottom to an 8¾-inch (inside diameter) ring, which held the funnels. The ring was incomplete—a 6¼-inch gap was left to allow easy placement and removal of the funnels (Fig. 3).

RESULTS AND DISCUSSION

Prior to a banding drive, the holding cages were placed end to end with the first one butted to the separate drop door next to the pot of the trap (Fig. 1). Following the drive, the geese were driven into the holding cages. Each cage held 12 geese. Only space would limit the number of holding cages that could be used at one time. The same cages could also be used to drive geese into, following a cannon net shot, provided the mesh of the net was small enough (1½ inches) to prevent entanglement of the birds.

We found the 1- × 1-inch weld wire superior to the 1 × 2 because it greatly reduced injury to the birds' bills. The plywood floor also prevented injury to the webs and toes of the geese; if left too long, however, the birds tended to get messy from excrement on the floor.

The geese were carried in the cages to the banding table where they were removed and placed in the funnels. At the table, 1–4 men sat (on stools) or stood to sex, age, and band the geese efficiently. Head, bill, tail, and foot measurements could also readily be taken, and identification collars could be easily placed.

Canada geese at Seney had a great size variation (6–15 pounds). The funnel described worked best on the geese in the 7- to 12-pound class. Funnel sizes should be reduced proportionately for use with smaller races of geese. Following band placement, the goose, still in the funnel, was removed from the table, set on the scales, weighed, and released (Fig. 3).

In 1963 and 1964, 915 Canada geese were handled as herein described at the Seney National Wildlife Refuge. The method was efficient and significantly reduced handling and injury to the geese. Of equal importance, it markedly reduced wear and tear on the banders.

Received for publication February 2, 1965.

AGE DETERMINATION AND NOTES ON THE BREEDING AGE OF BLACK BRANT[1]

STANLEY W. HARRIS, Humboldt State College, Arcata, California
PETER E. K. SHEPHERD, Alaska Department of Fish and Game, Fairbanks

Abstract: Presence of one or a few white-tipped secondary coverts on wings of flightless black brant (*Branta bernicla orientalis*) in summer identified birds as yearlings. Older brant had black secondary coverts, and goslings had a complete set of new, white-tipped coverts. Of 19 known 2-year-old female brant trapped, 6 had *brood patches* and apparently had made attempts to nest. No yearling of either sex showed any evidence of having nested.

Hansen and Nelson (1957. Brant of the Bering Sea—migration and mortality. *Trans. N. Am. Wildl. Conf.* 22:237–254) emphasized the need for an aging technique which would permit the banding of large samples of known-aged black brant on the breeding grounds. Such banding would permit determination of minimum breeding age of brant, allowing more accurate assessment of reproductive potential than is now possible.

During studies of the nesting ecology and production of black brant by the Alaska Department of Fish and Game on the lower Yukon–Kuskokwim Delta of Alaska in 1962 and 1963, a technique was developed that allowed the separation of yearling and adult black brant during the summer molt. The method was based on the fact that the coverts of the secondary wing feathers in the juvenile brant have white tips (Kortright, F. H. 1942:394–395. *The ducks, geese and swans of North America.* The American Wildlife Institute, Washington, D. C. viii + 476pp.). These white-tipped secondary coverts are molted during the bird's first summer molt at the

[1] A contribution from Federal Aid to Wildlife Restoration Project W-6-R, Alaska Department of Fish and Game.